

**NASA Advisory Council**  
National Aeronautics and Space Administration  
Washington, DC 20546

*Kenneth D. Bowersox, Interim Chair*

September 30, 2016

Mr. Charles F. Bolden, Jr.  
Administrator  
National Aeronautics and Space Administration  
Washington, DC 20546

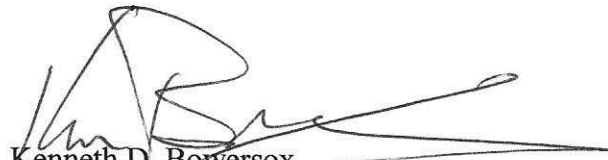
Dear Administrator Bolden:

The NASA Advisory Council held its second public meeting of 2016 at the NASA Glenn Research Center in Cleveland, Ohio, July 28-29, 2016.

As a result of our deliberations, and in accordance with our "two-tier" approach for transmitting recommendations and findings to the NASA leadership, the Council approved three Council findings for your consideration (enclosed). The Council also approved one Committee recommendation and four Committee findings for consideration by the respective NASA Associate Administrator. Copies of the latter also are enclosed for your information and awareness.

If you have any questions or wish to discuss further, please don't hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ken Bowersox', with a long horizontal flourish extending to the right.

Kenneth D. Bowersox  
Interim Chair

Enclosures

## NASA Advisory Council Finding

### Current NASA Status

<b>Name of Committee:</b>	Human Exploration and Operations Committee
<b>Chair of Committee:</b>	Mr. Wayne Hale, <i>Interim Chair</i>
<b>Date of Council Public Deliberation:</b>	July 28, 2016
<b>Short Title of Finding:</b>	Current NASA Status

**Finding:** The NASA Advisory Council supports the current systematic approach to the ultimate goal of human exploration of Mars that is guided by the three domains of NASA’s “Journey to Mars” strategy, which builds sequentially from Earth dependent to proving ground to Earth independent.

We commend the leadership and staff of NASA Headquarters and the Centers for the steady progress being made on the International Space Station, Commercial Crew, Orion, and Space Launch System.

**NASA Advisory Council Finding**  
**Concerning Soyuz Transportation**

**Name of Committee:** Human Exploration and Operations Committee

**Chair of Committee:** Mr. Wayne Hale, *Interim Chair*

**Date of Council Public Deliberation:** July 28, 2016

**Short Title of Finding:** Concerning Soyuz Transportation

**Finding:** The NASA Advisory Council is concerned about the possibility of a gap in International Space Station (ISS) transportation for NASA crew. The current schedules of both Commercial Crew Program (CCP) providers show completion of certification in time to allow for crew rotation to ISS in CY 2018, however there is very little margin. Human spaceflight development programs generally suffer schedule slips due to their technical complexity; the integration of commercial providers into government service adds further obstacles to CCP.

It is therefore prudent to protect for delays in post-certification missions from today's schedule. Since NASA has purchased Soyuz seats only through CY 2018, any delay of CCP operational capability beyond CY 2018 could result in the inability to send NASA astronauts to ISS until one of the CCP providers can complete certification.

Due to long lead time required to procure Soyuz seats, a decision must be made by the end of CY 2016 to guarantee access to ISS in CY 2019, or NASA may be forced to reduce – or possibly eliminate – its crew complement aboard ISS.

## NASA Advisory Council Finding

### Technology Development and Mars Architecture

**Name of Committee:** Human Exploration and Operations Committee  
Technology, Innovation and Engineering Committee

**Chair of Committee:** Mr. Wayne Hale, *Interim Chair*  
Mr. William Ballhaus, *Chair*

**Date of Council Public Deliberation:** July 28-29, 2016

**Short Title of Finding:** Technology Development and Mars Architecture

**Finding:** The NASA “Journey to Mars” plan has identified milestone decision points for critical technology incorporation. The determination of technology readiness at those decision points will drive the overall space architecture plan for the long term.

There are several complex low Technology Readiness Level (TRL) technologies which may be of significant benefit to the Journey to Mars if developed in the proper time. Development starting in the near term will be critical if these technologies are to be considered when the actionable decision time arrives. The measures of effectiveness of relevant technologies will be informed by system analysis.

The Associate Administrators of the Human Exploration and Operations Mission Directorate (HEOMD) and the Space Technology Mission Directorate (STMD) will identify the risk reduction lead times required for those technologies to meet the milestone decision point. Appropriate resource loaded development plans can be established based on these timelines.

Failure of advanced technologies to be developed to the point where they can be selected at the critical milestones will mean that older technology with lesser performance may have to be incorporated in the space architecture.

## NASA Advisory Council – Committee Recommendation

### Science Committee Recommendation to NASA Associate Administrator for Science Mission Directorate

#### Hitomi

<b>Name of Committee:</b>	Science Committee
<b>Chair of Committee:</b>	Dr. Bradley Peterson
<b>Date of Council Public Deliberation:</b>	July 28-29, 2016
<b>Short Title of Recommendation:</b>	Hitomi

**Recommendation:** The Science Committee recommends that NASA proceed with the plan to rebuild the Soft X-ray Spectrometer (SXS) instrument, with the appropriate level of emphasis given astrophysics decadal survey priorities.

**Major Reasons for the Recommendation:** On March 26, 2016, Hitomi (née Astro-H) experienced an unrecoverable failure. Before the failure, the successful demonstration of the SXS demonstrated Technology Readiness Level (TRL)-9 for this technology and retired the technology maturation risk. On June 1 and June 14, 2016, Japan Aerospace Exploration Agency (JAXA) President Okumura announced JAXA's intent to study a rebuild of Hitomi ("Astro-H2") and JAXA has asked NASA to consider participating in the mission. NASA has agreed to consider a build-to-print of the instrument demonstrated on Hitomi. JAXA has indicated a desire to begin development of Astro-H2, if approved, in FY 2017.

Assuming a build-to-print SXS instrument, and taking into account lessons learned and available flight spare parts, the estimated cost for the United States would be \$70-90M (FY 2017 - FY 2021) for a 4.5 year Phase A-D (not including operations and Guest Observer program). At this time, it is not known whether any additional funding would be made available to supplement the planned NASA astrophysics budget to undertake a NASA contribution to Astro-H2. The approximately \$20M per year required for a NASA contribution to Astro-H2 is smaller than the challenges to the planned astrophysics program in recent appropriations that have been accommodated with modest acceptable impact.

**Consequences of No Action on the Recommendation:** Loss of a unique capability in x-ray observations for the scientific community. Such observations are identified as a priority in the decadal survey.

## **NASA Advisory Council – Committee Finding**

### **Science Committee Finding to NASA Associate Administrator for Science Mission Directorate**

#### **Astrophysics Data Modernization**

<b>Name of Committee:</b>	Science Committee
<b>Chair of Committee:</b>	Dr. Bradley Peterson
<b>Date of Council Public Deliberation:</b>	July 28-29, 2016
<b>Short Title of Finding:</b>	Astrophysics Data Modernization

**Finding:** The Astrophysics Data System (ADS) is a large bibliographic, web-based system that provides a searchable database of the research literature in astronomy, solar physics, solar-terrestrial interactions, planetary science, Earth science and physics. It is funded out of the NASA Science Mission Directorate (SMD) Astrophysics data archive program that also supports the Science Archive Research Centers. The ADS, freely available to the public, allows a researcher to locate the entire published literature based on queries of author, title, keyword, astronomical target, abstract or full text. Links are provided to references, citations, and on-line data associated with each article. The ADS is widely used and is an invaluable resource to the research community; for instance, it is not uncommon for a space scientist have daily use of the ADS. ADS datasets are up-to-date and the services developed are at the frontier of digital library services. Other scholarly fields often have weaker and more costly bibliographic systems.

Modernization of the ADS database engine, user and visualization interfaces has been proposed but implementation may not be feasible at current funding levels.

**NASA Advisory Council – Committee Finding**

**Science Committee Finding  
to NASA Associate Administrator for  
Science Mission Directorate**

**Additional Resources Needed in Planetary Protection Office**

<b>Name of Committee:</b>	Science Committee
<b>Chair of Committee:</b>	Dr. Bradley Peterson
<b>Date of Council Public Deliberation:</b>	July 28-29, 2016
<b>Short Title of Finding:</b>	Additional Resources Needed in Planetary Protection Office

**Finding:** The Science Committee finds that additional resources are needed in the NASA Office of Planetary Protection to address increased workload. In recent years, there has been an increase in the number of missions involving planetary protection considerations and in the complexity of those missions. With the growing participation of commercial entities in space exploration, the workload will only increase in the future. Of note, the European Space Agency (ESA) planetary protection office has a larger cadre of staff assigned to the office who provide laboratory capabilities and administrative support. Having additional resources in the NASA Office of Planetary Protection is necessary to ensure ongoing and timely compliance with the Outer Space Treaty. If additional resources are not provided, obligations will not be met in a timely manner, resulting in delays and increased costs.

## **NASA Advisory Council – Committee Finding**

### **Aeronautics Committee Finding to NASA Associate Administrator for Aeronautics Research Mission Directorate**

#### **Thrust 4 Roadmap Outbrief**

<b>Name of Committee:</b>	Aeronautics Committee
<b>Chair of Committee:</b>	Ms. Marion Blakey
<b>Date of Council Public Deliberation:</b>	July 28, 2016
<b>Short Title of Finding:</b>	Thrust 4 Roadmap Outbrief

**Finding:** The Aeronautics Committee endorsed and complimented the NASA Aeronautics Research Mission Directorate (ARMD) on the way that its strategy has been implemented and agreed that it provides a clear beacon to guide NASA’s aeronautics program. Specifically in the area of reducing carbon emissions, the Committee encourages NASA to widen the trade space and not be afraid to consider ideas well beyond the constraints of conventional boundaries. The Committee finds that in this area NASA may need to further incentivize and promote cross pollination of ideas across its various research programs.



## **NASA Advisory Council – Committee Finding**

### **Aeronautics Committee Finding to NASA Associate Administrator for Aeronautics Research Mission Directorate**

#### **New Aviation Horizons Initiative**

<b>Name of Committee:</b>	Aeronautics Committee
<b>Chair of Committee:</b>	Ms. Marion Blakey
<b>Date of Council Public Deliberation:</b>	July 28, 2016
<b>Short Title of Finding:</b>	New Aviation Horizons Initiative

**Finding:** The Aeronautics Committee believes that the NASA plan for the X-planes program is an important opportunity to highlight the advance technology development that is driving the future. The Committee agrees that this initiative has concrete and real benefits and will capture the minds of the next generation and will bring excitement to the public. The Committee suggests NASA should open up the aperture to include sub-scale demonstrators and avoid preconceived solutions that have too many constraints. The Committee views the New Aviation Horizons Initiative as an incredible opportunity to maintain U.S. world leadership in aerospace and to advance the growth potential of the industry. The Committee commended NASA's efforts in bringing industry, academia and other government agencies to the table to develop the program and support its success.

